

# Cancer immunology, bioinformatics and chemokine evidence link vaccines contaminated with animal proteins to autoimmune disease: a detailed look at Crohn's disease and Vitiligo

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## Background

Catalase is an autoantigen in Crohn's disease (CD) and other inflammatory bowel diseases (IBD). Vaccines are contaminated with catalase and can be a cause of CD as previously described.<sup>1</sup>

Glycoprotein 2 (GP2) is another autoantigen linked to CD.<sup>2,3</sup>

Tyrosinase and GP100 are autoantigens linked to vitiligo.<sup>4,5</sup>

Vaccines are contaminated with numerous animal proteins.<sup>6</sup> The role of animal protein contaminated vaccines in the etiology of type 1 diabetes (T1D) and neuromyelitis optica spectrum disorders (NMOSD), were previously described.<sup>7-9</sup>

## Methods

Uniprot<sup>10</sup> and BLASTP<sup>11</sup> are used to determine homology between human proteins and animal proteins that contaminate vaccines.

## Results

### Homology to human GP2

*Bos taurus* 77%

*Sus scrofa* 76%

*Cavia porcellus* 72%

*Gallus gallus* 43%

### Homology to human tyrosinase

*Bos taurus* 87%

*Sus scrofa* 90%

*Cavia porcellus* 85%

*Gallus gallus* 73%

### Homology to human GP100

*Bos taurus* 77%

*Sus scrofa* 81%

*Cavia porcellus* 77%

*Gallus gallus* 42%

## Discussion

### LASR T cells

As previously described for T1D, low affinity self reactive (LASR) T cells that barely qualify to be positively selected in the thymus, can have high enough affinity to self peptides to be functional and cause autoimmune disease upon activation.<sup>7</sup> T cells with T cell receptors (TCR) that recognize peptides that differ by as little as one amino acid from a self peptide, can be positively selected and migrate to the periphery.<sup>12</sup>

If homology is 100%, animal derived peptides being identical to self peptides, have a low probability of causing autoimmune disease. This is because T cells that bind self peptides with high affinity would be negatively selected in the thymus. With 42%-90% homology between human and animal proteins shown above, there are many regions where protein sequence is identical except for one to two amino acid difference. Sample sequence results are shown below highlighting autoepitopes aligning to near-identical regions. These peptides from near-identical regions can be expected to activate LASR T cells, resulting in autoimmune disease. Live viruses or aluminum adjuvants in subunit vaccines provide the necessary innate immune system derived costimulation<sup>13</sup> required for LASR T cell activation.<sup>14</sup> It was previously shown in the case of T1D, that autoepitopes are indeed located at near-identical regions of the proteins.<sup>7</sup>

Therefore, as in T1D, these animal proteins can be expected to cause the development of autoimmune diseases such as Crohn's and vitiligo.

### Evidence from cancer research on LASR T cell mediated autoimmunity

Cancer research has demonstrated that immunization with homologous xenogeneic proteins (such as vaccines contaminated with animal proteins that resemble human proteins) results in autoimmunity.<sup>15</sup> As Naftzger et al.<sup>15</sup> describe, tolerance can be broken by introducing altered antigens. Animal proteins are an ideal source of altered antigens. As shown before<sup>7</sup> and in sections below, animal proteins contain numerous regions that are altered compared to human proteins. Yu et al.<sup>16</sup> describe another mechanism of altered antigens breaking self-tolerance, that involves MHC binding stability. Exposure to peptide sequence IMDQVPFSV caused autoimmunity to ITDQVPFSV.

Engelhorn et al.<sup>17</sup> describe generation of immune responses to self as a result of presenting numerous antigen variants. This is exactly the case with vaccines contaminated with animal cell cultures containing thousands of animal proteins that are variants of human proteins.

Skipper et al.<sup>18</sup> describe a strong T cell response to YMDGTMSQV on melanoma cells which is a single amino acid change from the normal tyrosinase sequence YMNGTMSQV.

The natural purpose of LASR T cells is likely to be cancer defense. With animal protein contaminated vaccines, we trigger the cancer response. A cancer related mutation can cause a single amino acid alteration in a self peptide. Numerous animal peptides naturally have single amino acid alterations compared to human peptides. With thousands of animal proteins contaminating vaccines, a widespread cancer response results following vaccination. Thus increasing the probability of autoimmunity as described by Engelhorn et al.<sup>17</sup>

### Skin homing receptors - the smoking gun

As described in the case of T1D<sup>7</sup>, autoreactive CD8+ T cells in vitiligo, also express CCR4 skin homing chemokine receptors.<sup>19</sup> CD4+ T cells in Crohn's disease also express CCR4 skin homing receptors.<sup>20</sup>

The role of yeast (*Saccharomyces cerevisiae*) contaminated vaccines in the etiology of Systemic Lupus Erythematosus (SLE) was previously described.<sup>21</sup> Wang et al.<sup>22</sup> provide epidemiological evidence of vaccines causing SLE and rheumatoid arthritis. Yang et al.<sup>23</sup> describe increased expression of CCR4 skin homing receptors on CD4+ T cells in ankylosing spondylitis, rheumatoid arthritis and SLE as well.

Dendritic cells that capture antigens, imprint T cells with homing receptors corresponding to the location where the antigens were captured.<sup>24,25</sup> This is evidence that the antigens involved in the above diseases were all captured in skin tissue, as would be expected with intramuscular or subcutaneous administration of animal protein contaminated vaccines.

### Animals don't like our proteins being injected into them either ...

Immunizing mice with human proteins caused the development of vitiligo in mice.<sup>15</sup> So, immunizing humans with animal proteins resulting in vitiligo (or any number of other autoimmune diseases) comes as no surprise at all.

### **Conclusion**

The above findings add to the growing evidence of vaccines inducing autoimmune diseases.<sup>22,26-29</sup> Autoantibody and autoreactive T cell levels can vary from person to person. Not everyone will develop overt disease. For every case of diagnosed autoimmune disease, there are numerous subclinical cases. Balaji et al.<sup>30</sup> describe long term persistent inflammation following typhoid vaccine and decreased adiponectin levels in asymptomatic children. A likely case of autoimmunity against adiponectin as previously described.<sup>31</sup> These subclinical diseases could shave decades off your life. So "rare" diagnosed vaccine adverse events are the tip of the iceberg.

It is quite obvious that there are fundamental problems with vaccine design and safety. Vaccine designers need to go back to the drawing board. We need vaccines that are safe by design.<sup>29,32</sup>

### **Detailed sample BLASTP results**

Human GP2 vs. bovine GP2

pancreatic secretory granule membrane major glycoprotein GP2 precursor [Bos taurus]  
[NP\\_001069418.2](#) 534 1

[See 1 more title\(s\)](#)

[GenPeptGraphics](#) [Next Match](#) [Previous Match](#)

## Alignment statistics for match #1

	Score	Expect	Identities	Positives	Gaps
	1214 bits(2856)	0.0	415/540(77%)	431/540(79%)	9/540(1%)
Query 1	MPHLMERMVSGSLLWLALVSCILTQASAVQRGYGNPIEASSYGLDLDCGAPGTPEAHVCF 60				
	M +L+ERM LWLAL S ILT S Q GY N SY DLDCGAPGTPEA+ CF				
Sbjct 1	MSQLLERM--TSVLWLALASYILTSSTEQQGYRNSTNTGSYEKDLDCGAPGTPEAQLCF 58				
Query 61	DPCQNYTLLDEPFRSTENSAGSQGCDKNMSGWYRFVGEAGVVRMSETCVQVHRCQTDAPMW 120				
	DPCQNYTLL+EPFRSTEN QGCD + GWYRFVG+GGVRM E CV RCQT AP+W				
Sbjct 59	DPCQNYTLLNEPFRSTENTEDIQGCDSKDHGWYRFVGDGGVRMPEDCVPTFRCQTSAPLW 118				
Query 121	LNGTHPALGDGITNHTACAHWSGNCCFWKTEVLVKACPGGYHVYRLEGPWCNLRVCTVP 180				
	LNGTHP LG+GI N TACAHWSGNCC WKTEVLVKACPG Y VYRLEGP C LRYCT				
Sbjct 119	LNGTHPGLGEGIVNRTACAHWSGNCCFWKTEVLVKACPGPYVYRLEGPQCSLRYCT-- 176				
Query 181	RDPSTVEDKCEKACRPEEEC-LALNSTWGCFCRQDLNSSDVHSLQPQLDCGPRIKVKVD 239				
	DP T EDKC+ CRPEEEC L TWGCFRCRQDLN SDVHSLQPQLDCG EIKV D				
Sbjct 177	-DPATAEDKCDRTCRPEEECRLV-SGTWGCFCRQDLNVDVHSLQPQLDCGDTEIKVSLD 234				
Query 240	KCLLGGLGLGEEVIAYLRDPN--CSSILQTEERNWVSVTSPVQASACRNILERNQTHAIY 297				
	KCLLG LG G+EV AYLRD N CSS Q EE NW+SVT P QA AC NILERNQTHAIY				
Sbjct 235	KCLLGSGLFGDEVHAYLRDGNWNCSSLRQSEENWISVTNPTQAGACGNILERNQTHAIY 294				
Query 298	KNTLSLVNDFIIRDITILNINFQAYPLDMKVSQALQPIVSSLNVSDGNGEFIVRMAL 357				
	NTLSLVNDFIIRDITIL INFQAYPLDMKVSQ ALQPIVSSLN+ VDG GEF VRMAL				
Sbjct 295	INTLSLVNDFIIRDITILSINFQAYPLDMKVSQMALQPIVSSLNITVDGEGEFTVRMAL 354				
Query 358	FQDQNYTNPYEGDAVELSVESVLYVGAILEQGDTSRFNLVLRNCYATPTEDKADLVKYFI 417				
	FQDQ+YT PYEG AV LSVES LYVG ILE GDTSRFNLV L NCYATPTEDK D VKYFI				
Sbjct 355	FQDQDYTSPYEGTAVMLSVESMLYVGITILRGDTSRFNLVLRNCYATPTEDKTDVPKYFI 414				
Query 418	IRNSCSNQRDSTIHVEENGQSSESRSFSVQMFAGHYDLVFLHCEIHLCDSLNEQCQPSC 477				
	IRNSC NQRDSTI VEENG S ESRFSVQMF FAG YDLVFLHCE+ LCD E+CQPSC				
Sbjct 415	IRNSCPNQRDSTISVEENGVSASRSFSVQMFAGNYDLVFLHCEVSLCDFIKEECQPSC 474				
Query 478	SRSQVRSEVPAILDLARVLDLGPITRGAQSPGVMNGTPSTAGFLVAWPMVLLTVLLAWLF 537				
	SRSQ RSE AID ARVLDLGPITR GAQS GVM GTP TAGFLVAWP+VLL VLLA LF				
Sbjct 475	SRSQRLRSEGVAIDPARVLDLGPITRKGAQSLGVMGTPNTAGFLVAWPLVLLPVLLAGLF 534				

## Human tyrosinase vs. bovine tyrosinase

Autoepitopes identified by Kemp et al.<sup>4</sup> are highlighted below showing that 3 out of 4 epitopes align to near-identical regions, exactly as would be expected for LASR T cell mediated autoimmunity.

TPA: tyrosinase precursor [Bos taurus]

[DAA14054.1](#) 530 1

[See 2 more title\(s\)](#)

[GenPeptGraphics](#) [Next Match](#) [Previous Match](#)

### Alignment statistics for match #1

Score	Expect	Method	Identities	Positives	Gaps
983 bits(2541)	0.0	Compositional matrix adjust.	461/530(87%)	493/530(93%)	1/530(0%)
Query 1	MLLAVLYCLLSFQTSAGHFPRACVSSKNLMEKECCPPWSGDRSPCGQLSGRGSCQNILL 60				
	MLLA LYCLLSWF+TSAGHFPRAC SSK+L EKECCPPW+GD SPCG+LSGRGSCQ+++L				
Sbjct 1	MLLAALYCLLSFRTSAGHFPRACASSKSLTEKECCPPWAGDGSPCGRLSGRGSCQDVIL 60				
Query 61	SNAPLGPQFPFTGVDDRESWPSVFYNRTCQCSGNFMGFNCGNCKFGFWGPNCTERRLLVR 120				
	S APLGPQFPFTGVDDRESWPS+FYNRTCQC NFMGFNCG+CKFGF GP CTERLLVR				
Sbjct 61	STAPLGPQFPFTGVDDRESWPSIFYNRTCQCFNFMGFNCGSCKFGFRGPRCTERRLLVR 120				
Query 121	RNIFDLSAPEKDKFFAYLTLAKHTISSDYVIPIGTYGQMKNGSTPMFNDINIYDLFVWMH 180				
	RNIFDLS PEK+KF AYLTLAKHT S DYVIP GTYGQM +G+TP+FND+++YDLFVWMH				
Sbjct 121	RNIFDLSVPEKNKFLAYLTLAKHTTSPDYVIPTGTYGQMNHGTTPLFNDVSVYDLFVWMH 180				
Query 181	YYVSMDALLGGSEIWRDIDFAHEAPFLPWHRLFLLRWEQEIQKLTGDNFTIPYWDWRD 240				
	YYVS D LLG SE+WRDIDFAHEAP FLPWHRLFLL WEQEIQKLTGDNFTIPYWDWRD				
Sbjct 181	YYVSRDTLLGDSEVWRDIDFAHEAPGFLPWHRLFLLWEQEIQKLTGDNFTIPYWDWRD 240				
Query 241	AEKCDICTDEYMGGQHPTNPILLSPASFFSSWQIVCSRLEEYNSHQSLCNGTPEGPLLRN 300				
	AE CD+CTDEYMGG++P NPNLLSPASFFSSWQIVCSRLEEYNS Q+LCNGT EGPL RN				
Sbjct 241	AENCDEVCTDEYMGGRNPNANPNLLSPASFFSSWQIVCSRLEEYNSRQALCNGTSEGPLLRN 300				
Query 301	PGNHDKSRTPLRPSSADVEFCLSLTQYESGSMDKAANFSFRNTLEGFASPLTGIADASQS 360				
	PGNHDK+RTPLRPSSADVEFCLSLTQYESGSMDKAANFSFRNTLEGFA P+TGIADASQS				
Sbjct 301	PGNHDKARTPLRPSSADVEFCLSLTQYESGSMDKAANFSFRNTLEGFADPVTGIADASQS 360				
Query 361	SMHNALHIYMNGTMSQVQGSANDPIFLLHHAFVDSIFEQWLRHRPLQEVYPEANAPIGH 420				
	SMHNALHIYMNGTMSQV GSANDPIFLLHHAFVDSIFEQWLR++ PLQ+VYPEANAPIGH				
Sbjct 361	SMHNALHIYMNGTMSQVPGSANDPIFLLHHAFVDSIFEQWLRKYHPLQDVYPEANAPIGH 420				
Query 421	NRESYMPFIPLRYRNGDFFISSKDLGYDYSYLQSDPDSPFDYIKSYLEQASRIWSWLLG 480				
	NRESYMPFIPLRYRNGDFFISSKDLGYDYSYLQDS+PD FQDYIK YLEQA RIW WL+G				
Sbjct 421	NRESYMPFIPLRYRNGDFFISSKDLGYDYSYLQDSEPD FQDYIKPYLEQAQRIWPWLIG 480				
Query 481	AAMVGAVLTALLAGLVSLLCRHKRKLPEEKQPLLMEKEDYHSL-YQSHL 529				
	AA+VG+VLTA+L GL SLLCR KR QLPEEKQPLLMEKEDYH+L YQSHL				
Sbjct 481	AAVVGSVLTAVLGGLTSLLCRRKRNLPEEKQPLLMEKEDYHNLAMYQSHL 530				

Human gp100 vs. pig gp100

melanocyte protein PMEL [Sus scrofa]

[XP\\_020947439.1](#) 663 1

[GenPeptGraphics](#) [Next Match](#) [Previous Match](#)

### Alignment statistics for match #1

Score	Expect	Identities	Positives	Gaps
1561 bits(3673)	0.0	537/667(81%)	544/667(81%)	36/667(5%)
Query 1	MDLVLRKCLLHLAVIGALLAVGATKVPNRQDWLGVSRLRTKAWNRLYPEWTE--AQRL 58			
	MDLVL CLLH AV GA LAVGAT PR DWLGVSRLRTKAWN QLYPEWTE A			
Sbjct 27	MDLVLRKCLLHVAVMGAFVAVGATEGPRGRDWLGVSRLRTKAWNSQLYPEWTEIRAP-- 84			
Query 59	DCWRGGQVSLKVSNDGPTLIGANASFSIALNFPQSQKVLDPGQVIWVNNTIINGSQVWGG 118			

DCWRGG VSLKVSNDGPTLIGANASFSIAL FP SQKVLDPGQVIW NNTIINGSQVWGG  
 Sbjct 85 DCWRGGRVSLKVSNDGPTLIGANASFSIALHFPKSQKVLDPGQVIWANNTIINGSQVWGG 144

Query 119 QPVYPQETDDACIFPDGGPCPSGWSQKRSFVYVWKTWGQYWQVLGGPVSGLSIGTGRAM 178  
 QPVYPQE + CIFPDG CP G SQ RSFVYVWK WGQYWQVLGGPVSGLSIGTG A  
 Sbjct 145 QPVYPQEPNATCIFPDGAACPPGPSSQRRSFVYVWKAWGQYWQVLGGPVSGLSIGTGKAV 204

Query 179 LGTHTMEVTVYHRRGSRSYVPLAHSSAFTITDQVPFSVSVSQLRALDGGNKHFLRNQPL 238  
 LGTHTMEVTVYHRRGS SYVPLAHS SAFT+TDQVPFSVSVSQL ALD GNK FLR QPL  
 Sbjct 205 LGTHTMEVTVYHRRGSQSYVPLAHSRSAFTVTDQVPFSVSVSQLQALDRGNKRFLRKQPL 264

Query 239 TFALQLHDPGSGYLAEDLSYTWDFGDSSGTLISRALVVTHTYLEPGPVTAQVVLQAAIPL 298  
 TFALQLHDPGSGYLA ADLSYTWDFGD GTLISRALVVTHTYLE GPVTAQVVLQAAIPL  
 Sbjct 265 TFALQLHDPGSGYLAGADLSYTWDFGDNTGTLISRALVVTHTYLESGPVTAQVVLQAAIPL 324

Query 299 TSCGSSPVPGTDDGHRPTAEAPNTTAGQVPTTEVVGTTGQAPTAEPSTTSVQVPTTEV 358  
 TSCGSSPVPGTDDG PTAE P TTA QVPTTEVVGTTGQ PTAEPSTT VQVPT E  
 Sbjct 325 TSCGSSPVPGTDDGPVPTAETPGTTAKQVPTTEVVGTTGQMPTAEPSTTAVQVPTAE- 383

Query 359 ISTAPVQMPTAESTGM--TPEKVPVSEVMGTTLAEMSTPEATGMTPAEVSIVLSGTTAA 416  
 GM TP+ P SEV GTT A M T E P SGTT A  
 Sbjct 384 -----GMGTTDPDQAPTSEVRGTTPAVMPTVE-----P-----SGTTVA 416

Query 417 QVTTTEWVETTARELPIPEPEGPDASSIMSTESITGSLGPLLDGTATLRLVKRQVPLDCV 476  
 QVTTTE VETTA E P PEPE PD S M TE TGS PLLDGTATL LVKRQVPLDCV  
 Sbjct 417 QVTTTELVTETAGEVPTPEPESPDVSPFMPTEGLTGSQSPLLDGTATLILVKRQVPLDCV 476

Query 477 LYRYGSFSVTLDIVQGIESAEILQAVPSGEGDAFELTVSCQGGLPKEACMEISSPGCQPP 536  
 LYRYGSFS TLDIVQGIESAEILQAVPS EGDAFELTVSCQGGLPKEACM+ISSPGCQPP  
 Sbjct 477 LYRYGSFSLTLDIVQGIESAEILQAVPSSEGDFAFELTVSCQGGLPKEACMDISSPGCQPP 536

Query 537 AQRLCQPVLPSPACQLVLHQILKGGSGTYCLNVSLADTNSLAVVSTQLIMPGQEAGLGQV 596  
 AQRLCQPV PSPACQLVLHQ+LKGGSGTYCLNVSLADTNSLA VSTQL+MPGQE GLGQ  
 Sbjct 537 AQRLCQPVSPSPACQLVLHQVLKGGSGTYCLNVSLADTNSLAMVSTQLVMPGQESGLGQA 596

Query 597 PLIVGILLVLMMAVVLASLIYRRRLMKQD--FSVPQLPHSSSHWLRLPRIFCSCPIGENSP 654  
 PL VGILLVL A LASLIYRRRLMKQD PQLPH S WLRLP F SCP+GENSP  
 Sbjct 597 PLFVGILLVLIALLLASLIYRRRLMKQDSALPLPQLPHGRSPWLRLPWGFRSCPVGGENSP 656

Query 655 LLSGQQV 661  
 LLSGQQV  
 Sbjct 657 LLSGQQV 663

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